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ABSTRACT

This booklet notes that for a long time the American people were willing to pay any price for progress. Now may refuse to accept an environment that menaces their health and lowers their enjoyment of life. They are embracing a new environmental consciousness, a broader vision of reality, a more profound sense of their place in nature. Among the topics discussed are the health effects of environmental pollution, noise, water pollution, solid wastes, air pollution and its chronic effects, odors, pesticides, radiation, carcinogens, teratogens, and mutagens. The decade of the 70's is showing that a new environmental ethic does exist in the hearts and minds of the American people and it is the matchless opportunity of this generation to begin the restoration of environmental quality and the protection of health. (BT)

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health effects of environmental pollution

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foreword

For a long time the American people seemed willing to pay any price for progress. Now they refuse to accept an environment that menaces their health and lowers their enjoyment of life. They are embracing a new environmental consciousness, a broader vision of reality, a more profound sense of their place in nature.

We have already made a start toward restoring our natural heritage of sparkling skies and bright waters, uncluttered roadsides and serene communities. The road ahead is long and difficult; it's a toll road, not a freeway; every advance will have to be paid for in cash, hard work or abandoned attitudes. But it is the only road to long life and good health.

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health effects of environmental pollution

The increase in chronic and degenerative diseases is due in part at least, and probably in a very large part, to the environmental and behavioral changes that have resulted from industrialization and urbanization.

The modern environment is dangerous on two accounts: It contains elements that are outright noxious; it changes so rapidly that man cannot make fast enough the proper adaptive reponses to it.

Dr. Rene Dubos
The Rockefeller University

U.S. ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAY 1973

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introduction

The principal reason for controlling pollution is to protect human health and the ecological integrity of man's life-support systems. Innumerable other benefits can result from cleanup measures—financial savings, improved efficiency, esthetic pleasure—but the fundamental concern about environmental degradation is its threat to health and life.

The President of the United States re-emphasized the seriousness of the environmental impact on health in his message to Congress on that subject in 1972. He said that, since man developed under the pressure of natural pollutant stresses, he adapted to exist and thrive in spite of them, and perhaps evolved because of them. The President went on to explain, however, that "the burgeoning modern industrial society threatens to tip the balance the other way."

Man's recognition of the damage brought about by his activities has been slow, almost as slow as some environmental after-effects. The impact of environmental deterioration on health is often subtle, becoming apparent only when correction is not always possible. Frequently the results of contamination become known so belatedly that few remember any relationship between the cause and effect.

This slow, non-immediate response to pollution has made it difficult for many to comprehend the impact on health of environmental degradation. With the complexity of modern life and the countless forms of pollution, protecting health poses a major challenge. We know beyond a shadow of a doubt that environmental pollution has significantly adverse effects on the physical and emotional health of an increasing number of Americans.

The Environmental Protection Agency (EPA) was created in December 1970, to strengthen Federal efforts to protect human health and well-being, as well as the environment. EPA's principal function is to set and enforce standards that help to accomplish these national goals.

While much is already known about the health effects of some pollutants, the total impact of pollution is difficult

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to measure. What each pollutant does to a human depends on the physical and chemical properties of the pollutant, the length, intensity and method of exposure, and an individual's ability to tolerate the pollutant. Some people are especially susceptible to attack, notably the very young, the old and those afflicted by disease. Since resistance to pollution is an individual trait governed by such factors as age, heredity, general health, climate, occupation, residence, smoking and dietary habits, it is extremely difficult to assess with precision general effects upon a large population. Pollutants reach man through various avenues, each taking its unique toll. But virtually all forms of pollution affect man adversely to some degree.

This booklet is a layman's discussion of some of the threats to human health posed by environmental pollution. Repeatedly, hard, practical decisions must be made to solve obvious problems even though our knowledge of their actual danger to health may not be complete. There is no way to ascertain absolutely the chronic effects of environmental pollution. For example, we cannot state unequivocally that the continued accumulation of tiny amounts of pesticides in the fatty tissue of man and other organisms is a direct cause of disease. But no one can prove, either, that life for all time is not altered as a result. The field of environmental health effects is one of certainties and uncertainties in which, nevertheless, all judgment cannot remain suspended just because controversy over "proof" continues. This booklet presents part of the background that must be considered in our efforts to solve the problem of environmental risk to health.

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does the environment cause disease?

"Much of the speculation and controversy about whether or not pollution causes disease is irrelevant to the significance of pollution as a public health hazard. We are accustomed to thinking that a disease state is brought about by a single cause — a carryover from a period in public health history when virtually total emphasis was placed on *the* bacterial or viral agent which had to be present before a communicable disease could be recognized and dealt with. That there is frequently a simple association between an infectious disease agent and the acute disease reaction it provokes was once a startling revelation. And in public health, it has served us well and continues to serve us well. But we have learned that it is not the master key that unlocks all the secrets of disease and health. The idea that one factor is wholly responsible for any one illness is patently too simple to provide all the answers we need to deal with the chronic diseases which are on the rise today.

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"Chronic bronchitis . . . is a good example. It develops over a long period of time and can become crippling through a combination of many factors—air pollution, smoking, repeated and recurring bouts with infectious agents, occupational exposures—all affected, perhaps, by a hereditary predisposition. What then is *the* cause of chronic bronchitis? The answer is obvious. There is probably no single cause, but there is sufficient evidence that air pollution can and does contribute to its development. This is what really matters, whether we choose to consider air pollution *the* cause, one of several causes, or simply a contributing factor. . . .

"There are great deficiencies in our knowledge. We need to learn more about the pollutants which affect health — and in what amounts and under which conditions. But the qualitative evidence at hand conveys a clear message. There is no longer any doubt that pollution is a hazard to health—the entire complicated and often misconstrued question of 'cause' notwithstanding."

Luther L. Terry, M.D.
Former Surgeon General

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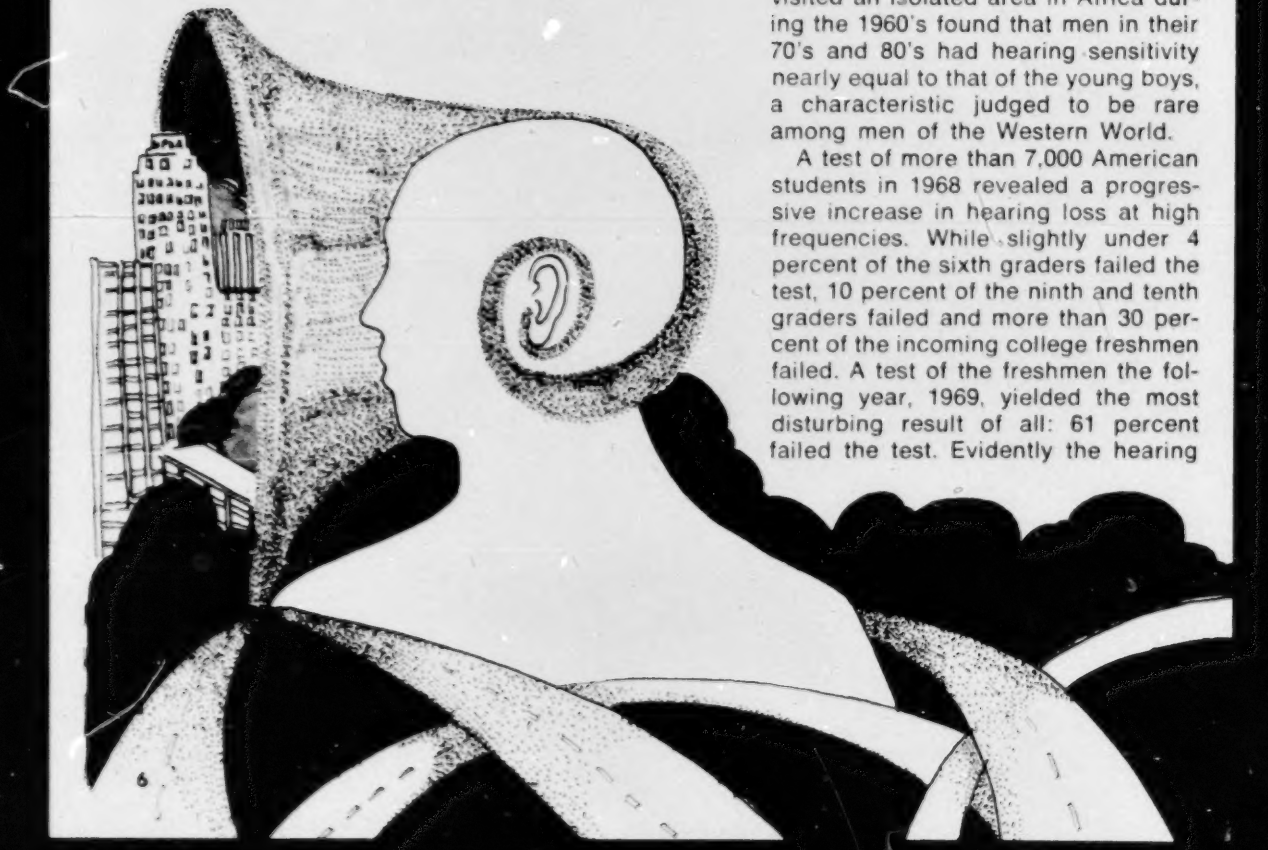
noise

People can be deafened by high levels of noise. Already, an estimated 16 million people in the United States suffer some hearing loss caused directly by excessive sound. And this plight differs from conditions observed elsewhere in the world. Scientists who visited an isolated area in Africa during the 1960's found that men in their 70's and 80's had hearing sensitivity nearly equal to that of the young boys, a characteristic judged to be rare among men of the Western World.

A test of more than 7,000 American students in 1968 revealed a progressive increase in hearing loss at high frequencies. While slightly under 4 percent of the sixth graders failed the test, 10 percent of the ninth and tenth graders failed and more than 30 percent of the incoming college freshmen failed. A test of the freshmen the following year, 1969, yielded the most disturbing result of all: 61 percent failed the test. Evidently the hearing



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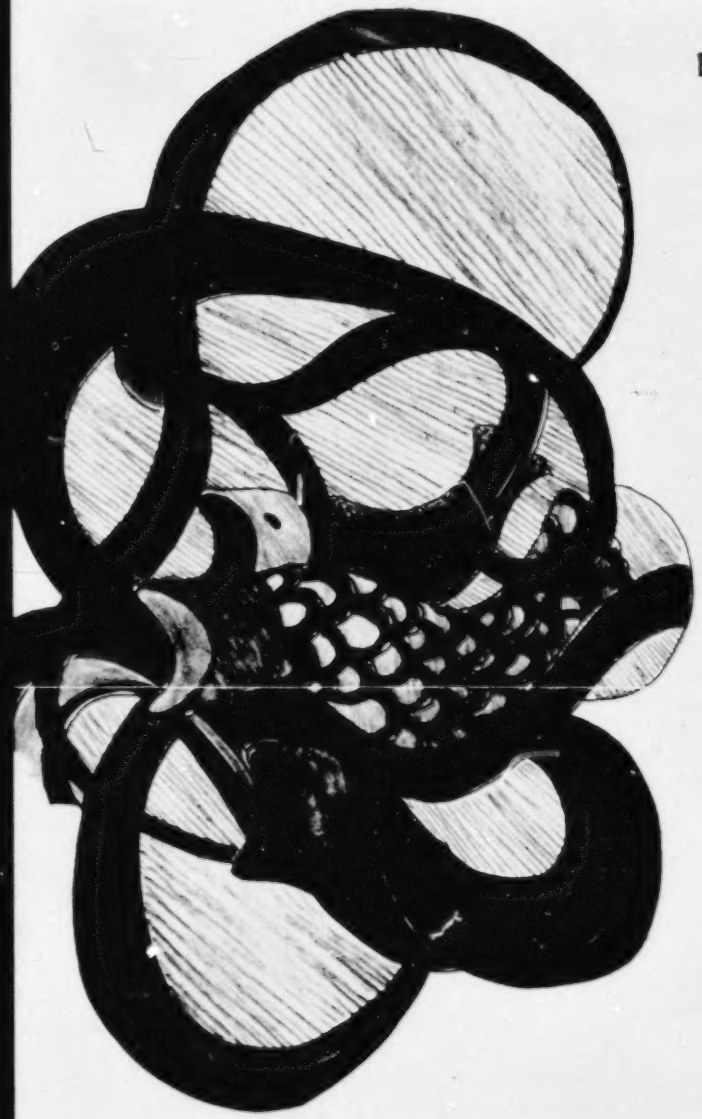
sensitivity of the young is becoming prematurely reduced, which implies that they may encounter more serious hearing problems in their middle years than the present group of 50- to 60-year-olds.

Excessive noise can alter endocrine, cardiovascular and neurologic functions and cause biochemical changes. Even a moderate, short sound, such as a heavy truck passing on the other side of the street, can produce immediate effects in a susceptible individual: blood vessels in the brain dilate; blood vessels elsewhere constrict; blood pressure rises; the heart rate changes; the pupils of the eyes dilate; and the endocrine glands may pour additional hormones into the blood. The stomach may change its rate of acid secretion. Most of these reactions are temporary although, if the noise persists, some could become chronic. Continuous exposure to excessive noise can lead to irritability, increased susceptibility to infection, heartburn, indigestion, gastrointestinal malfunctions, ulcers, high blood pressure and heart disease. In fact, workers exposed to unbroken high levels of noise exhibit a higher incidence of cardiovascular, ear-nose-and-throat and equilibrium disorders than other workers. In the extreme case, unwanted noise has been known to lead to a complete breakdown of bodily functions.

the psyche-- is it affected?

Beyond the physical waste environmental pollution costs man, there may be more profound effects: on mental health, for example. Most lead poisoning causes behavioral difficulties, perceptual disabilities, and emotional instability. Mercury poisoning causes emotional instability, tremors, fatigue, dizziness, memory and speech difficulties, and headaches. Insidious carbon-monoxide poisoning causes apathy, psychic tiredness, headaches, temporal-spatial disorientation, retardation, and psychosis. Psychological impairment following exposure to pesticides has been discussed elsewhere, and a number of studies have linked excessive noise to higher mental hospital admissions as well as to other psychological disturbances.



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water

Water pollution, too, can cause both immediate and long-term health effects. Fifty years ago the United States was plagued by massive outbreaks of typhoid, cholera, dysentery and other water-borne diseases. These epidemics largely have been eliminated through treatment of drinking water and better sewage treatment. However, from 1961 to 1970, 130 disease outbreaks and some 46,000 cases of poisoning were attributed to contaminated water supplies. As recently as 1970, a survey of public water systems revealed that 56 percent of the systems had major deficiencies, 25 percent contained bacteria or chemicals exceeding safe limits, and an additional 16 percent were distributing water that exceeded Federal drinking water standards and, hence, was considered dangerous. Some 8.1 million Americans are served such questionable water from public supplies; it is estimated that many more are receiving similarly questionable water from nonmunicipal supplies.

The sources of water pollution are innumerable. Major sources can be found in practically every variety of industrial, municipal and agricultural operation throughout the United States. Because of widespread use of high-nitrate fertilizers and concen-

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trated feedlots, nitrates in both ground and surface waters have increased in recent years. Already, many of our ground waters exceed the nitrate limits of drinking water standards. The significance of this fact is that once an underground water supply becomes contaminated, it is virtually impossible to purify. Infants up to three months of age suffer the principal risk of damage as a result of drinking water high in nitrates, damage that includes a blood disease that if not treated can result in death.

Sodium levels in American waters have also been rising. For the susceptible population, increased sodium intake from polluted waters can put a strain on the heart and exacerbate cardiovascular disease. Statistical associations have been reported also between cardiovascular mortality and the corrosiveness of water. Persons using more mineralized supplies tend to have lower death rates, and some scientists suspect that water that is corrosive to pipes causes more metals to be ingested. Officials know very little about the amount of trace metals in public water supplies throughout the country.

Sewage discharges can also contaminate surface waters with harmful bacteria and viruses. Water-borne viruses still cause hepatitis in this country and may be causing some gastroenteritis. Most hepatitis outbreaks from public supplies occur after the water is purified and result from contamination of the distribution system due to mechanical inadequacies. Many of our recreational waters too, are unsafe for contact sports because of high bacteria counts.

Water also serves as a route through which highly toxic pollutants can reach humans. A number of poisonous and carcinogenic chemicals from industrial waste have been found in drinking water. While their concentrations are low, we still do not know whether chronic health effects will result from their ingestion over a long time. Water supply intakes are also jeopardized from time to time by spills of oil and hazardous materials. Such spills in estuaries often make fish and shellfish unsuitable for food. Oil in water is known to concentrate fat-soluble poisons such as insecticides and certain chemicals many times higher than would normally occur in water alone. In this way, oil spilled into water can permit highly destructive amounts of pollutants to be ingested by organisms in man's food chain.

Mismanaged water resources can develop into swamps and stagnant areas that foster the growth of mosquitoes and insects. In the United States, mosquitoes still transmit disease, and encephalitis has occurred in epidemic form. A total of 3,121 people died of encephalitis during 1956-68.

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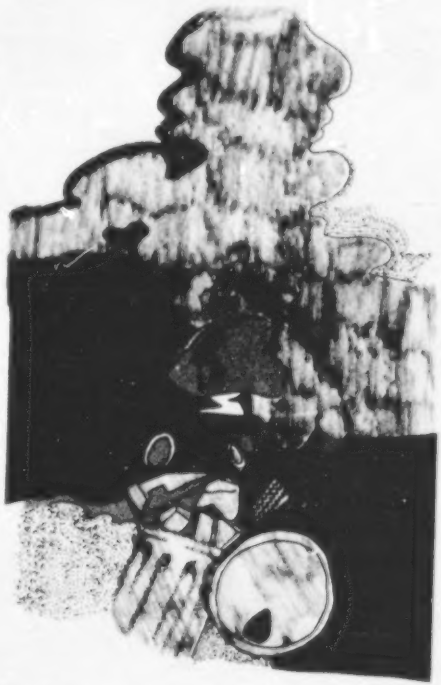
solid wastes

Environmental health cannot be compartmentalized. This is nowhere more evident than in the area of solid waste management. There are only three repositories for the wastes of society: the earth, its waters, and its atmosphere; and the use or misuse of any one is inextricably bound with the other two. Restrictions on the use of any one medium as a repository almost invariably lead to increased burdens on, and frequently to abuse of, the others. Certainly, improper management of solid wastes on land creates health hazards from both air and water pollution. For example, leachate from open dumps or improperly designed landfills will contribute to pollution of ground or surface waters; open burning of solid wastes and faulty incineration contribute to air pollution.

Conversely and somewhat paradoxically, what may be counted as successes for air and water pollution control programs may actually aggravate the public health problems of solid waste management. For example, effective waste water treatment plants produce solid sludges, which must be disposed of. A ban on home incinerators or open burning of yard debris immediately results in a greater burden on the solid waste collection, processing, and disposal system. And as land disposal activities are upgraded, some coastal communities look to the sea for ultimate disposal of their solid wastes. Management of solid wastes, then, is a root environmental issue with profound public health implications.

Perhaps the most obvious health aspect of waste management is the adverse effect of hazardous wastes—that is, wastes that—because of their toxic, corrosive, flammable, or explosive nature—are hazardous *per se*.



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These wastes, whether in the form of solids, liquids, or sludges, have a unique potential for affecting public health and the environment. Some are hazardous to human health; others adversely affect desirable plants and animals, and indirectly, man. They require special care in all aspects of their storage, collection, processing, and disposal.

Less obvious, but nonetheless important, are the adverse health impacts associated with seemingly "nonhazardous" wastes. The relationship between public health and improper storage and disposal of solid wastes has long been recognized. Rats, flies, and other disease vectors breed in open dumps and in residential areas where food and harborage are available. Among the diseases that have been directly or indirectly associated with the open dump are typhoid fever, cholera, dysentery, anthrax, trachoma, plague, and trichinosis.

Another health effect related to solid waste management is the occupational hazards of workers who provide waste collection and disposal services. They suffer 10 to 15 times as many injuries as the average worker in American industry—several times more than construction workers, loggers, and coal miners, all acknowledged to be in hazardous occupations. Furthermore, arthritis, cardiovascular disease, muscle and tendon diseases (particularly ailments affecting the back), skin diseases, and hernia are occupational health conditions common among refuse collectors.

Modern food-production and marketing techniques have created new potential health hazards. Livestock and poultry production in the United States is fast becoming concentrated in large-scale, confinement-type operations. These large concentrations of animals have greatly magnified the problem of managing wastes in a way that will minimize health hazards. Among the serious health-related effects possible in feedlot operations are the wholesale production of flies and the contamination of water from run-off.

The basic health and environmental problems associated with solid waste management are exacerbated by a number of factors related to our social and economic structures, institutions, and attitudes.

One such factor is the inequitability of these impacts on different population groups in the United States. Unfortunately, the urban poor, many already suffering from a lack of general sanitation, are most likely also to suffer from the ill effects of unsanitary storage and inadequate collection of waste. To the rural poor may be added the ill effects of improper disposal.

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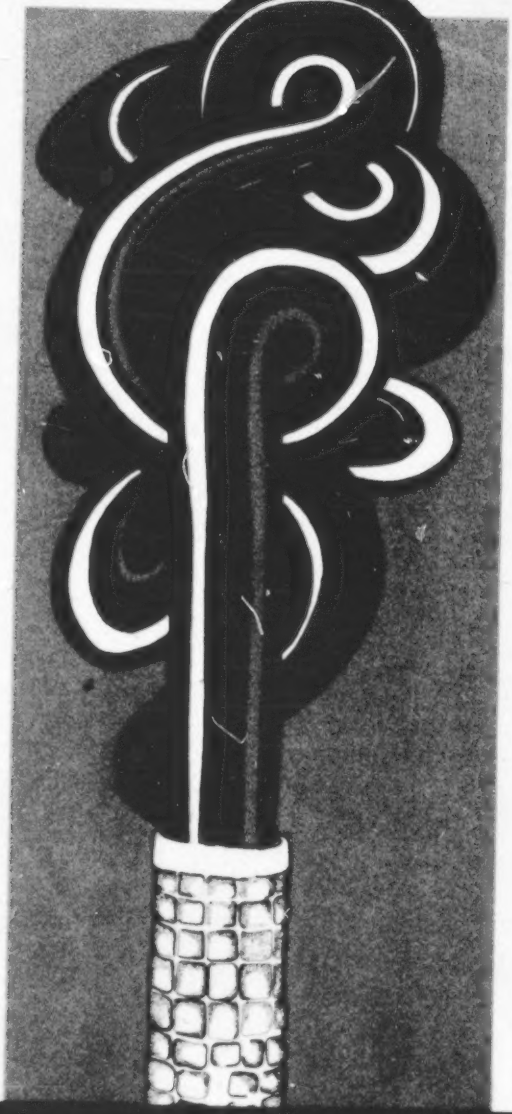

air

The most serious single consequence of air pollution is its impact upon the health of human beings. Sulfur oxides irritate the respiratory system, causing both temporary and permanent injury. When small particles are breathed in with sulfur oxides, the irritation—and injury—may increase significantly.

On Friday, December 5, 1952, the air of London, England became a deadly menace. A prolonged temperature inversion coupled with an anticyclonic high-pressure system held the city's air close to the ground, prevented winds from dispersing pollutants and forced the city's routine air pollutant emissions to accumulate heavily at ground level. For five days the Greater London area was blanketed in airborne muck. Few realized it at the time, but there were 4,000 more deaths than normal, hospital admissions were 48 percent greater than normal and sickness claims to the health insurance system were 108 percent above average. Eighty-four percent of those who died had preexisting heart and lung disease. Hospital admissions for respiratory illness increased threefold, and deaths due to chronic respiratory disease increased tenfold.

The same freak atmospheric conditions caused a similar incident in Donora, Pennsylvania in 1948. This

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small town of only 14,000 had 15 to 20 more deaths than normal during the episode, and more than 6,000 of its residents were adversely affected, 10 percent of them severely. Among those with preexisting illnesses, 88 percent of the asthmatics, 77 percent of those with heart disease, and 79 percent of those with chronic bronchitis and emphysema were adversely affected. Allowing for the great difference in population, Donora paid an even higher price for air pollution than London.

New York City has experienced similar though milder temperature inversions on numerous occasions during the last 50 years. In 1953, more than 200 excess deaths occurred in the city during a period of atmospheric stagnation. Birmingham, Alabama is another high-exposure area where residents frequently have exhibited a greater-than-average incidence of respiratory irritation symptoms such as coughing, burning throats or lungs, and shortness of breath. EPA's surveillance of people in both these cities indicates that nonsmokers develop irritative respiratory symptoms two or three times as frequently as nonsmoking residents of communities with less air pollution.

Unfortunately, the climatic conditions and human activities that permit critical buildups of pollutants are by no means uncommon in the United States. Inversions occur periodically in various parts of the country and will continue to threaten public health as long as air pollutants are emitted into the atmosphere in amounts sufficient to accumulate to dangerous levels.

Air Pollutants' Chronic Effects

Air pollution disasters such as these are alarming, but of even greater concern to many are the effects of air pollution on health from chronic low-level exposure. While a great deal of information exists about the effects of air pollution, we are still very far from being able to assess accurately what low, persistent levels of air pollution do to human beings.

Emphysema is the fastest growing cause of death in the United States. Emphysema and chronic bronchitis—the chronic obstructive lung diseases—are now second only to heart disease as a leading cause of disability compensated by Social Security. Both these diseases are common grounds for chronic disability, lost workdays and mortality; they curtail not only our physical but our economic health. In 1966, 18,000 more deaths were attributed to these two causes than a decade earlier—an increase of 2½ times.

Air pollution aggravates not only the symptoms of chronic lung disease but also the frequency and severity of asthma. Early childhood exposure to

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heavy pollution is believed to be an important contribution to a lowered pulmonary reserve capacity in adult life. Children from high exposure areas suffer a greater risk of developing chronic lung disease in adulthood than children reared in cleaner communities. Statistics also show that residents of communities with persistently high levels of pollution have higher death rates than residents of other communities. Particulates and sulfur oxides are not the only major classes of pervasive pollutants. Oxides of nitrogen, found in the air as a result of all combustion, have been associated with acute respiratory disease.

Air pollution also plays a role in highway safety. The California Department of Public Health reported in 1971 that as the level of photochemical oxidants increased, so did the number of accidents. Carbon monoxide is a threat, too. In today's heavy traffic, carbon monoxide concentrations may reach levels of 80 to 115 milligrams per cubic meter (mg/m^3 of air (70 to 100 parts per million). A milligram is .0035 ounces. A cubic meter of air is about equal to a medium-sized auto's trunk space. Prolonged exposure to concentrations of 58 mg/m^3 (50 parts per million) impairs a driver's judgment and his ability to respond. Not only can the inhalation of carbon monoxide disable the central nervous system, but it can also impair vision, produce headache, and exert a strain on the heart.

Extremely Hazardous Air Pollutants

There are other air pollutants extremely hazardous in minute amounts. Each has its particular adverse characteristics which place unique stress on human beings. The total number of hazardous pollutants commonly found throughout the country is unknown, but the introduction of new chemicals into manufacturing processes alone is estimated in the thousands per year. It is impossible to discuss potential health effects of all likely hazardous pollutants, so here are four examples that suggest the kind of health effects that may be involved.

The inhalation of *asbestos* fibers has been related to asbestosis, bronchogenic cancer, mesothelioma, and other malignant diseases. Symptoms of mesothelioma, for instance, develop about 30 years after the initial exposure to asbestos, and some physicians expect an increase in the disease among persons who worked in or near American shipyards during World War II. Asbestos is used in many products and industrial operations.

Beryllium is a metal commonly used in rocket fuels, missile guidance systems, nuclear reactors and atomic weapons. The most deleterious effect

of inhaled beryllium is a progressive lung disease.

Mercury is commonly used in batteries, mildew-proofing and the manufacture of paint, pulp, and paper. Airborne mercury can affect the central nervous system and can lead to weight loss, insomnia, tremors and psychological disturbances.

Lead absorption is often prevalent among preschool children in urban areas. In the past, we attributed most of the poisoning to eating lead-based paint chipped from the walls of older dwellings, but recent evidence indicates that other environmental sources of lead are contributing to the problem. High concentrations of lead in dust, soil and vegetation near streets and highways clearly can be attributed to lead emissions from motor vehicles, and precipitation samples from locations throughout the United States show a positive correlation between gasoline consumption and the lead content of rain. People who ingest excessive amounts of lead may show neurological impairment such as seizures, mental retardation, cerebral palsy, optic atrophy, tremors, and behavioral disorders. Ordinarily we all accumulate lead in our bodies, but urban residents usually have higher average blood levels of lead than rural residents. Children and the newborn have a particular susceptibility to lead damage of the central nervous system.

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can odors hurt you?

Odors, too, have an impact on health. Pungent gases can irritate eyes and lead to appetite loss, weight loss, vomiting, nausea, gagging, restlessness, sleeplessness, anxiety, emotional disturbances, and the inability to concentrate. Odors also aggravate physical, mental, and psychological conditions that can be worsened by stress or strain. Odors also may last for long periods in clothes, materials, and vegetation, thereby extending their impact beyond the time a source produces them.

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pesticides

Pesticides have brought tremendous benefits to human health by controlling insect-borne disease and improving the production of food and fiber. At the same time, the use of pesticides has become so widespread that man and animals from earth's most remote regions have been touched. Measurable levels of DDT have been found in Antarctic penguins, although they have never been directly exposed to the compound. And pesticide residues can be found in many surface waters of the world, and in sundry seafoods.

Some pesticides persist in the environment for very long periods and can move up the food chain through a process called biological magnification. In other words, minute quantities of chemicals absorbed by plankton and insects are transferred in constantly increasing concentrations to fish, birds, animals and man through food. The chemicals are then stored in body fat and tissues. Some oysters may concentrate certain dissolved toxicants by 2,000 times.

Like lead, certain pesticides can interfere with the functioning of the central nervous system. That pesticides can cause illness at high exposure levels is indisputable. More than 75 different types of pesticides have caused human poisoning. Reactions to excessive exposure vary greatly and include damage to the nervous system, respiratory and digestive tracts, skin, eyes, mucous membranes, metabolism, visceral organs and the psyche. It is believed that pesticidal poisoning kills up to 200 people a year.

The herbicide 2,4,5-T causes various malformations in the developing embryo of experimental animals and a number of other pesticides including DDT may cause cancer in certain species. However, no indisputable evidence exists to link human malignancy causally with pesticides.

According to a recent report by the President's Advisory Committee on Predator Control, pesticidal poisons have two important assets: They are effective and economical. However, few current methods of lethal control are simultaneously selective, humane, safe, effective, economical, specific, and without potential side effects.

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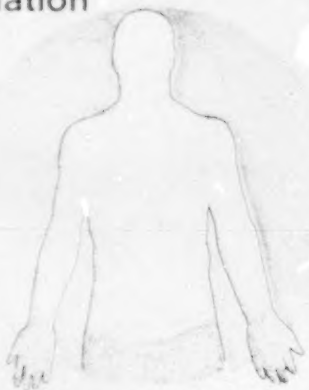
radiation



Increasing man-made radiation also poses a danger to our health. The principal adverse effects that radiation can have on human health are genetic disturbances and cancer. Apparently, some body tissues are particularly vulnerable to irradiation, notably the blood-forming organs, thyroid, bone marrow, breast, lung and reproductive organs. The young, particularly the unborn, are most susceptible to radiation damage.

We all receive radiation from natural sources over which man has little control. Our remaining exposure comes from medical and dental X-ray machines, fallout from nuclear weapons testing, faulty color television sets, uranium mines and mills and fabrication plants, nuclear-power generating and fuel-reprocessing installations, and various electronic devices. Many hospitals and laboratories commonly use radioactive isotopes in basic research and patient diagnosis and treatment. And construction materials with radioactive properties have been used for homes, schools, factories and other structures. In Tennessee, cement blocks are often made of Conasauga shale, which contains high concentrations of thorium, and in Florida, blocks are sometimes made of phosphate rock, which contains high concentrations of radium. In buildings constructed of these materials, radioactive gases seep out of the blocks and accumulate in the ambient air. Granite, too, frequently emits gamma radiation.

Despite this variety of sources, man's exposure to radiation thus far has been quite low. Nevertheless we know very little about the long-term effects of repeated exposure to radiation at low levels. One major hazard is damage to or alteration of human genes, since natural background radiation is believed to be one of the causes of natural mutation. It is generally accepted that any amount of radiation, however small, can cause damage to genetic cells and hence an indeterminate number of undesirable mutations. Such genetic damage is believed to be cumulative. Also, it is generally accepted that any increase in radiation exposure can cause increases in the frequency of many cancers.

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carcinogens, teratogens and mutagens

These three terms have become more familiar to many Americans as we have become more aware of the perils of environmental pollution. Carcinogens are substances that cause cancer. Teratogens cause individual birth defects. Mutagens cause hereditary changes that may be passed from one generation to another.

Carcinogens

The effect of carcinogens on human tissue is generally irreversible. Incidences of cancer in man today may reflect an exposure of many years ago. Similarly, carcinogenic contaminants added to the environment today may render their account many years from now.

Potent carcinogens that produce cancer in experimental animals are found in low concentrations in food. Weak carcinogens, such as some air and water pollutants, certain pesticides and food additives, are everywhere. Not only are we ignorant of the carcinogenic potential of many substances repeatedly introduced into the environment, but also we do not know much about the synergistic effects of two or more carcinogens, or even one carcinogen plus various promoting agents or other chemicals. It is not widely appreciated that a combination of pollutants can be more damaging than the sum of their separate effects. Many substances which are not carcinogenic by themselves interact with other substances to promote the development of cancer.

Cancer in the United States has become a major cause of death since 1900. During this century there has been an absolute increase in cancer deaths which cannot be explained as

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a result of either the increase or aging of the population.

Cancer of the respiratory tract has shown the most rapid increase ever recorded for a noninfectious disease, 1800 percent during the past 40 years. And the death rate from lung cancer for urban residents is twice the rural rate, even after allowance for smoking habits. In the vast majority of cases, pollution in urban areas exceeds levels in less populated regions.

Teratogens

Numerous environmental pollutants are not only carcinogenic but teratogenic and mutagenic as well. Teratogens may cause monstrous deformities. Congenital defects account for 14 percent of all infant deaths and are the third most common explanation for death in the newborn. Many substances induce abnormalities in a fetus at levels below those needed to make the mother ill. Methylmercury, for example, affects prenatal development; children born to mothers who have eaten food contaminated by it frequently exhibit a disorder resembling cerebral palsy. One of the most disquieting aspects of teratogens is that their potential for destruction has rarely been known in advance. X-rays, German measles virus, mercury, thalidomide—all exacted costly tolls before their teratogenic features were recognized.

Mutagens

Mutagens result in transmissible changes which affect potential offspring. If a pollutant damages a cell while its capacity for division remains unimpaired, the result may be defects among future generations.

Numerous chemicals which occur in environmental pollutants are mutagenic in large doses. But we simply do not know whether most potential environmental mutagens at present levels represent a hazard to man.

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a new environmental ethic

Environmental odors, stresses, and toxic substances constantly bombard our senses, interfere with our peace of mind and diminish man's sense of fulfillment. The very activities that challenge man's intellect and satisfy other needs—of accomplishment, convenience, comfort, and esthetic satisfaction — are frequently those that impair his highest functions. Environmental degradation can limit man's perception, his perspective and his judgment. In some cases, it may hinder solution of everyday problems. Any impairment of health, whether transient or permanent, can lead to a deterioration of faculties absolutely necessary for responsibility, creativity, and the ability to adapt to new and complex situations.

A people insensitive to the impact of pollution on human health can easily become desensitized to their own lessened capacities. As in the case of poisoning, behavioral changes dangerous to a patient and others can occur before he realizes he is poisoned and seeks medical care. Anyone who thinks pollution is not his business is unconcerned about his own well-being.

Hearteningly, the decade of the 70's is showing that a new environmental ethic does exist in the hearts and minds of the American people. And it is the matchless opportunity of this generation to begin the restoration of environmental quality and the protection of health so essential to mankind's finest attainments.

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